

## PATENT ABSTRACTS OF JAPAN

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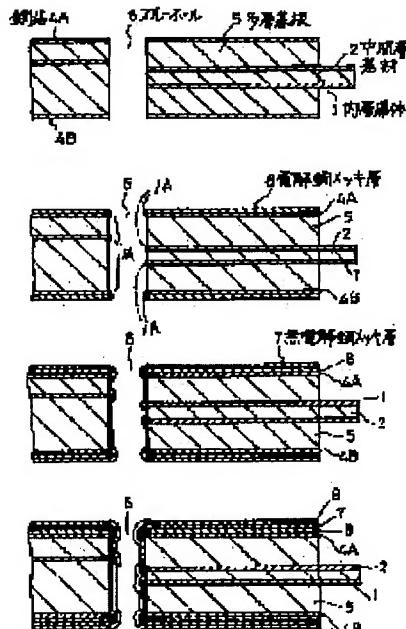
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## (54) MANUFACTURE OF PRINTED WIRING BOARD

## (57)Abstract:

PURPOSE: To provide the manufacture of a printed wiring board, in which an internal layer conductor exposed in a through-hole is connected positively.

CONSTITUTION: An intermediate-layer base material 2, to which an internal layer conductor 1 is formed, copper foils 4A, 4B and a prepreg are laminated so that one end section of the intermediate-layer base material 2 is protruded from one end section of the prepreg and a laminated board 5 is prepared, a through-hole 6 is bored to the laminated board 5, the internal layer conductor 1 of the intermediate-layer base material 2 and the copper foils 4A, 4B on both sides are electrically conducted mutually, and the multilayer board 5 and an electrode plate are faced oppositely and dipped in an electrolytic copper plating solution. Electrolytic copper plated layers 8 are formed on the internal layer conductor 1 exposed to the inwall surface of the through-hole 6 and the copper foils 4A, 4B on both sides, and the multilayer board 5 is dipped in an electroless copper plating solution and electroless copper plated layers 7 are shaped on the whole inwall surface of the through-hole 6 and the copper foils 4A, 4B on the surface and the rear. The board is dipped in the electrolytic copper plating solution again, and the plated layers 8 are formed through an electrolytic plating method.



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CLAIMS

## [Claim(s)]

[Claim 1]An internal layer conductor (1) A formed interlayer substrate (2) Copper foil (4A, 4B), And prepreg (3) Said interlayer substrate (2) An end part is said prepreg (3). As it overflows from an end part, it laminates to multilayer structure, and it is a laminated circuit board (5). It accomplishes, This laminated circuit board (5) A through hole (6) Said interlayer substrate (2) after carrying out an opening An internal layer conductor (1) As copper foil (4A, 4B) of the surface and a rear face flows mutually, it is a multilayer substrate (5). Make an electrode plate (13) counter and it is immersed in an electrolytic copper plating solution (12), said through hole (6) An internal layer conductor (1) exposed to an internal surface. It is an electrolytic copper metal skin (8) selectively to copper foil (4A, 4B) of the surface and a rear face. It forms and, subsequently is said multilayer substrate (5). It is immersed in a non-electrolytic copper plating solution, and is a through hole (6). The internal-surface whole, It is a non-electrolytic copper metal skin (7) to copper foil (4A, 4B) of the surface and a rear face. It forms, Subsequently, it is a through hole (6) by an electrolytic plating method after this substrate is again immersed in an electrolytic copper plating solution (12). It is an electrolytic copper metal skin (8) to copper foil (4A, 4B) of inside, the surface, and a rear face. A manufacturing method of a printed wired board having a process to form.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] This invention relates to the manufacturing method of a printed wired board with which start the manufacturing method of a printed wired board, especially it was made for connection with the internal layer conductor of this patchboard, surface copper foil, and this internal layer conductor and copper foil on the back to become good in the manufacturing method of a multilayer printed wiring board.

[0002] In order for the miniaturization of electronic equipment and advanced features to progress, to require a product also with a high-density printed wired board and to attain the Kota stratification of this printed wired board, and a miniaturization in recent years, it is required that the metal layer of an internal layer conductor should also be formed thinly.

[0003] Thus, when the thickness of an internal layer conductor becomes thin, it becomes difficult to take continuity connection through this internal layer conductor, copper foil of a surface layer or a back layer, and through hole, and a manufacturing method of the printed wired board which can take connection with this internal layer conductor and copper foil of a surface layer or a back layer good is desired.

#### [0004]

[Description of the Prior Art] It attaches and states to the manufacturing method of the conventional printed wired board. As the copper foil 4A of a surface layer and the copper foil 4B of a back layer are installed, it heats, the interlayer substrate 2 which has the internal layer conductor 1 formed in the predetermined pattern as shown in drawing 3 (a) is pressurized on both sides of the prepreg 3 and it is shown in drawing 3 (b), it laminates to the multilayer substrate 5.

[0005] Subsequently, the opening of the through hole 6 is carried out to the multilayer substrate 5 of drawing 3 (b). Subsequently, this multilayer substrate 5 is immersed in a non-electrolytic copper plating solution, and as shown in drawing 3 (c), the non-electrolytic copper metal skin 7 is formed in this through hole 6 and on the copper foil 4A of rear surface both sides, and 4B.

[0006] Subsequently, the power supplying part 9 is formed in the multilayer substrate 5 which has this non-electrolytic copper metal skin 7, although this substrate is used as the electrode by the side of - and is not illustrated, as the opening 6A of the above-mentioned through hole 6 is countered in a copper electrode plate at + side, two sheets are arranged, and it is immersed into an electrolytic copper plating solution in this state.

[0007] And as shown in drawing 3 (d), the electrolytic copper metal skin 8 is formed in this through hole 6 and on the copper foil 4A of rear surface both sides in which the non-electrolytic copper metal skin 7 was formed, and 4B, a flow with the internal layer conductor 1 and the copper foil 4A and 4B of rear surface both sides is taken through the through hole 6, and the printed wired board is formed.

#### [0008]

[Problem(s) to be Solved by the Invention] However, since the thickness of the above mentioned internal layer conductor 1 is very thin as shown in drawing 3 (c) by such a conventional method, The flow satisfied between the non-electrolytic copper metal skin 7 formed in the internal surface of this through hole 6 and the exposed surface 1A of the internal layer conductor 1 drawn by the internal surface of this through hole 6 cannot be taken.

[0009] Therefore, there is a problem used as the internal layer conductor 1 drawn by the through hole internal surface and the printed wired board which cannot take enough a flow with the copper foil 4A and 4B of a rear surface double-sided layer, Such a printed wired board has a problem which produces the situation which generates heat between the exposed surface 1A of the internal layer conductor 1 exposed to the internal surface of this through hole, and the non-electrolytic copper metal skin 7 with insufficient connection and from

which the formed printed wired board becomes poor, when electronic parts are mounted and are operated. [0010] Only therefore, the resin layer 11 except the internal layer conductor 1 drawn by the internal surface of the through hole 6 of the multilayer substrate 5 as the conventional method was improved further and it was shown in drawing 4. It etches selectively using an etching reagent like potassium permanganate ( $KMnO_4$ ). Only the internal layer conductor 1 was exposed more nearly selectively than the internal surface of the through hole 6, the surface area of the exposed surface 1A of this internal layer conductor 1 was increased, and the etchback method which strengthens connection with the non-electrolytic copper metal skin formed in the through hole 6 at a next process is taken.

[0011] However, management of a drug solution and preparation of a drug solution are complicated, and the etch residue thing after etching adheres on the surface of a multilayer substrate, the problem of polluting the surface of a multilayer substrate occurs [ control etc. of the concentration of the drug solution of the potassium permanganate used for this method are needed ], and this etchback method is not preferred.

[0012] This invention solves the above-mentioned problem and connection between an internal layer conductor and copper foil of a rear surface double-sided layer also aims \*\* at offer of the manufacturing method of the printed wired board it was made to change good not using the above mentioned complicated drug solution.

[0013]

[Means for Solving the Problem] An interlayer substrate with which a manufacturing method of a printed wired board of this invention formed an internal layer conductor. As an end part of said interlayer substrate protrudes copper foil and prepreg from an end part of said prepreg, it laminates them to multilayer structure. An internal layer conductor which immerses a substrate which they laminated to multilayer structure as an internal layer conductor of said interlayer substrate and copper foil of a surface layer flowed through mutually after carrying out the opening of the through hole in an electrolytic copper plating solution, and is drawn by internal surface of said through hole. Form an electrolytic copper metal skin in copper foil of a surface layer selectively, and subsequently to a non-electrolytic copper plating solution this substrate is immersed, and The through hole internal-surface whole. After forming a non-electrolytic copper metal skin in copper foil of a rear surface double-sided layer and this substrate is immersed in an electrolytic copper plating solution, it has the process of forming an electrolytic copper metal skin in copper foil of a surface layer in a through hole with an electrolytic copper plating method.

[0014]

[Function] The method of this invention laminates them to multilayer structure, as the end part of said interlayer substrate protrudes the interlayer substrate, copper foil, and prepreg in which the internal layer conductor was formed, from the end part of said prepreg. After carrying out the opening of the through hole, the substrate which they laminated to multilayer structure as the internal layer conductor of said interlayer substrate and copper foil of the surface layer flowed through mutually is immersed in an electrolytic copper plating solution, and an electrolytic copper metal skin is selectively formed in the internal layer conductor currently drawn by the internal surface of said through hole, and copper foil of a surface layer.

[0015] If it does in this way, the surface area of the exposed surface of the internal layer conductor drawn in the above mentioned through hole will increase.

Then, connection with the non-electrolytic copper metal skin formed in a through hole becomes good.

It is not necessary to use a complicated medicine which carries out etchback only of the resin selectively, and what is necessary is just coming to use the electrolytic copper plating solution used for manufacture of the usual printed wired board.

[0016]

[Example] Hereafter, it explains to details per example of this invention using a drawing. As shown in above mentioned drawing 3 (a), the interlayer substrate 2 in which the copper foil 4A and 4B, the prepreg 3, and the internal layer conductor 1 of the rear surface double-sided layer were formed is heated, application-of-pressure lamination is carried out and a multilayer substrate is formed.

[0017] Subsequently, it is made for the size of the longitudinal direction of the interlayer substrate 2 to become longer than prepreg at the time of this above-mentioned lamination, as shown in drawing 1 (a). And from the end part of the multilayer substrate 5 which laminated and formed prepreg etc., as the end part of this interlayer substrate 2 overflows, it laminates.

[0018] Subsequently, the opening of the through hole 6 is carried out to this multilayer substrate 5.

Subsequently, as are shown in drawing 1 (b) and drawing 2, and a flow is taken between the internal layer conductor 1 and the copper foil 4A and 4B of rear surface both sides and the through hole 6 of this multilayer substrate 5 counters with the copper electrode plate 13, it is immersed into the electrolytic copper plating

solution 12. And the electrolytic copper metal skin 8 is selectively formed on the copper foil 4A of the exposed surface 1A of the internal layer conductor 1 exposed in the through hole 6 using electrolytic copper plating, and rear surface both sides, and 4B.

[0019]As for this method, these people are Japanese Patent Application No. 3-52334 before. It carries out from the end of a printed wired board like the plating method of the high aspect board proposed in the item by supplying necessity and the current which changes to electrolytic copper plating treatment from the internal layer conductor of the overflowing interlayer substrate.

[0020]If it does in this way, the electrolytic copper metal skin 8 will be selectively formed on the exposed surface of the internal layer conductor 1 exposed in the through hole 6. Subsequently, as shown in drawing 1 (c), this multilayer substrate 5 is immersed in a non-electrolytic copper plating solution (not shown), and the non-electrolytic copper metal skin 7 is formed in the copper foil 4A and 4B of the inside of the through hole 6, and rear surface both sides.

[0021]Since the electrolytic copper metal skin 8 is selectively formed in the exposed surface of the internal layer conductor 1 drawn by the internal surface of the through hole 6 formed with the above mentioned electrolytic copper plating if it does in this way, The surface area of the drawn exposed surface into the through hole 6 of this internal layer conductor 1 becomes large, Connection with the non-electrolytic copper metal skin 7 formed at the next process can be enough taken now, the faulty connection of the exposed surface of an internal layer conductor and a non-electrolytic copper metal skin decreases like before, and the phenomenon which generates heat in the portion at the time of operation can be removed.

[0022]It can use as it is that this electrolytic copper plating solution is used for the manufacturing process of the usual printed wired board, and the complicated drug solution for etchback is prepared specially, and it becomes unnecessary to use it.

[0023]Subsequently, as shown in drawing 1 (d), the electrolytic copper metal skin 8 is formed in the through hole of this multilayer substrate, and on copper foil of rear surface both sides. Subsequently, it is used in the case of electrolytic copper plating of the exposed surface of the internal layer conductor in a through hole, the interlayer substrate 2 which has overflowed is cut from the end part of the multilayer substrate 5, and it is considered as the printed wired board of a predetermined size.

[0024]If it does in this way, connection of the internal layer conductor drawn by the through hole internal surface and the conductor layer of rear surface both sides can take now good enough, and the quality printed wired board which a faulty connection does not generate easily will be obtained.

[0025]

[Effect of the Invention]As stated above, according to the method of this invention, it is effective in the printed wired board of high-reliability with good connection between the internal surface of a through hole and the conductor layer of rear surface both sides of a printed wired board being obtained using a complicated drug solution which is used for the etchback method, as there is nothing.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1]It is a sectional view showing the process of the method of this invention.

[Drawing 2]It is an explanatory view of the electrolytic copper plating method in the method of this invention.

[Drawing 3]It is an explanatory view showing the conventional method.

[Drawing 4]It is a sectional view showing the conventional method.

### [Description of Notations]

1 Internal layer conductor

2 Interlayer substrate

3 Prepreg

4A, 4B copper foil

5 Multilayer substrate

6 Through hole

7 Non-electrolytic copper metal skin

8 Electrolytic copper metal skin

12 Electrolytic copper plating solution

13 Electrode plate

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[Translation done.]

## \* NOTICES \*

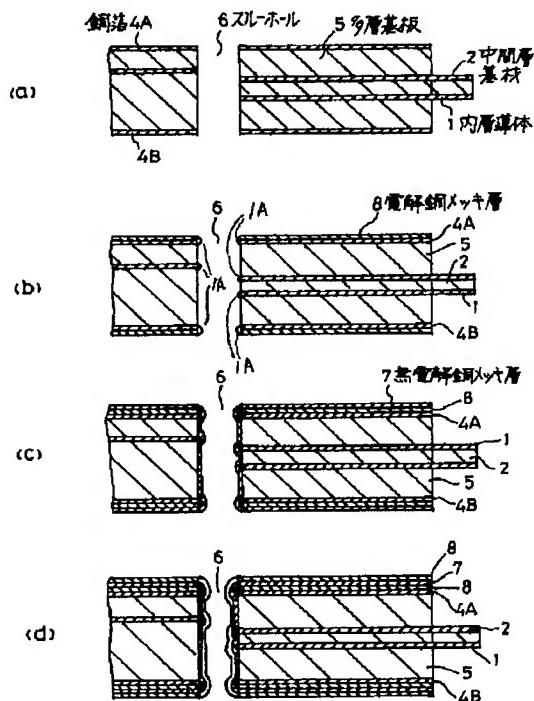
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## DRAWINGS

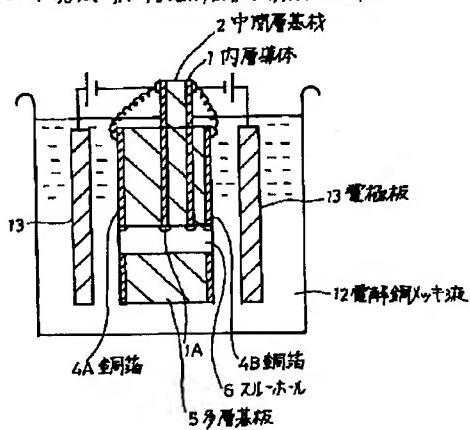
## [Drawing 1]

本発明の方法の工程を示す断面図



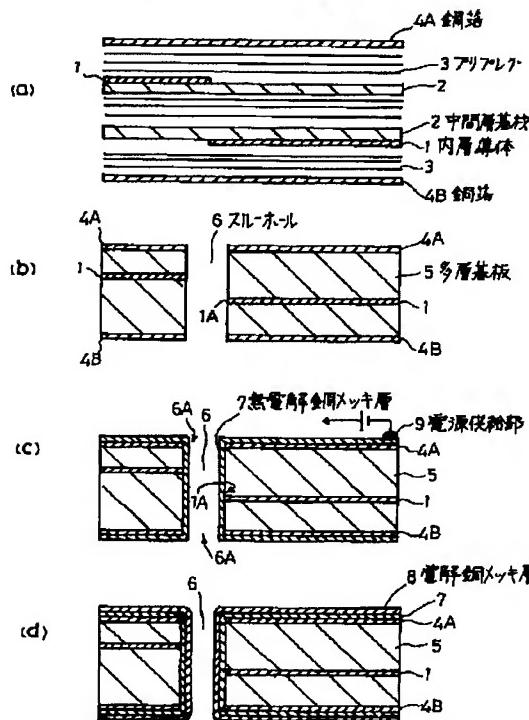
## [Drawing 2]

本発明の方法に於ける電解銅めっき方法の説明図



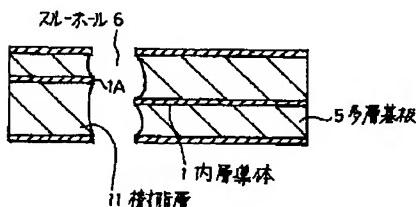
## [Drawing 3]

## 従来の方法を示す説明図



## [Drawing 4]

従来の方法を示す断面図



[Translation done.]

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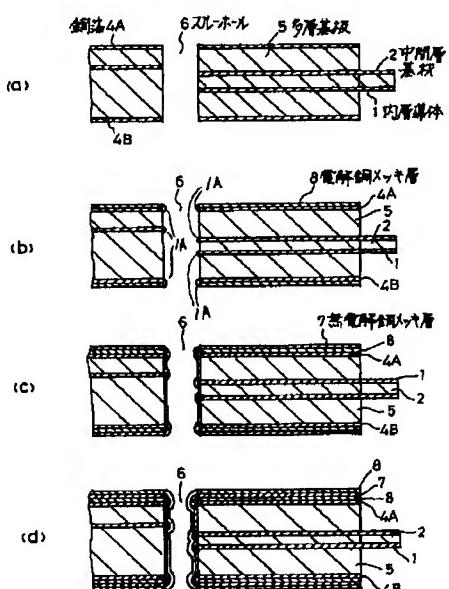
(54)【発明の名称】 プリント配線板の製造方法

(57)【要約】 (修正有)

【目的】 スルーホール内に露出した内層導体の接続が確実に取れるプリント配線板の製造方法を提供する。

【構成】 内層導体1を形成した中間層基材2、銅箔4A,4B、およびプリプレグを中間層基材2の一端部がプリプレグの一端部よりはみ出すようにして積層基板5と成し、これにスルーホール6を開口した後、中間層基材2の内層導体1と表面および裏面の銅箔4A,4Bが互いに導通するようにして多層基板5と電極板を対向させて電解銅メッキ液内に浸漬し、スルーホール6の内壁面に露出している内層導体1と、表面および裏面の銅箔4A,4Bに電解銅メッキ層8を形成し、次いで多層基板5を無電解銅メッキ液に浸漬してスルーホール6の内壁面全体と、表面および裏面の銅箔4A,4Bに無電解銅メッキ層7を形成する。次いで該基板を再度電解銅メッキ液に浸漬した後、電解銅メッキ方法によりメッキ層8を形成する。

本発明の方法の工程を示す断面図



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## 【特許請求の範囲】

【請求項1】 内層導体(1)を形成した中間層基材(2)、銅箔(4A,4B)、およびプリプレグ(3)を前記中間層基材(2)の一端部が前記プリプレグ(3)の一端部よりはみ出すようにして多層構造に積層して積層基板(5)と成し、該積層基板(5)にスルーホール(6)を開口した後、前記中間層基材(2)の内層導体(1)と表面および裏面の銅箔(4A,4B)が互いに導通するようにして多層基板(5)と電極板(13)を対向させて電解銅メッキ液(12)内に浸漬し、前記スルーホール(6)の内壁面に露出している内層導体(1)と、表面および裏面の銅箔(4A,4B)を選択的に電解銅メッキ層(8)を形成し、  
次いで前記多層基板(5)を無電解銅メッキ液に浸漬してスルーホール(6)の内壁面全体と、表面および裏面の銅箔(4A,4B)に無電解銅メッキ層(7)を形成し、  
次いで該基板を再度電解銅メッキ液(12)に浸漬した後、電解メッキ方法によりスルーホール(6)内と表面および裏面の銅箔(4A,4B)に電解銅メッキ層(8)を形成する工程を有することを特徴とするプリント配線板の製造方法。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明はプリント配線板の製造方法に係り、特に多層プリント配線板の製造方法に於いて、該配線板の内層導体と表面の銅箔、および該内層導体と裏面の銅箔との接続が良好になるようにしたプリント配線板の製造方法に関する。

【0002】近年、電子機器の小型化、高機能化が進み、プリント配線板も高密度な製品が要求され、該プリント配線板の高多層化、小型化を図るために、内層導体の金属層も薄く形成することが要求される。

【0003】このように内層導体の厚さが薄くなると、この内層導体と表面層や裏面層の銅箔とスルーホールを通じて導通接続を取るのが困難となり、この内層導体と表面層や裏面層の銅箔との接続が良好に取れるようなプリント配線板の製造方法が望まれる。

## 【0004】

【従来の技術】従来のプリント配線板の製造方法について述べる。図3(a)に示すように所定のパターンに形成された内層導体1を有する中間層基材2にプリプレグ3を挟んで表面層の銅箔4Aおよび裏面層の銅箔4Bを設置し、加熱、加圧して図3(b)に示すように多層基板5に積層する。

【0005】次いで図3(b)の多層基板5にスルーホール6を開口する。次いでこの多層基板5を無電解銅メッキ液に浸漬し、図3(c)に示すように、このスルーホール6内および表裏両面の銅箔4A,4B上に無電解銅メッキ層7を形成する。

【0006】次いでこの無電解銅メッキ層7を有する多層基板5に電源供給部9を設け、該基板を一側の電極と

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し、図示しないが+側に銅の電極板を上記スルーホール6の開口部6Aに対向するようにして2枚配置し、この状態で電解銅メッキ液中に浸漬する。

【0007】そして図3(d)に示すように、このスルーホール6内、および無電解銅メッキ層7を形成した表裏両面の銅箔4A,4B上に電解銅メッキ層8を形成して、スルーホール6を通じて内層導体1と表裏両面の銅箔4A,4Bとの導通を取ってプリント配線板を形成している。

## 【0008】

【発明が解決しようとする課題】然し、このような従来の方法では図3(c)に示すように、前記した内層導体1の厚さが極めて薄いために、このスルーホール6の内壁面に形成された無電解銅メッキ層7と、このスルーホール6の内壁面に導出された内層導体1の露出面1Aとの間で満足する導通が取れない。

【0009】そのため、スルーホール内壁面に導出された内層導体1と、表裏両面層の銅箔4A,4Bとの導通が充分取れないプリント配線板となる問題があり、このようなプリント配線板は電子部品を実装して動作させた場合、このスルーホールの内壁面に露出した内層導体1の露出面1Aと、接続が不十分な無電解銅メッキ層7との間で発熱するような事態を生じ、形成されたプリント配線板が不良となる問題がある。

【0010】そのため、従来の方法を更に改良して図4に示すように、多層基板5のスルーホール6の内壁面に導出された内層導体1を除く樹脂層11のみを、過マンガン酸カリウム( $KMnO_4$ )のようなエッチング液を用いて選択的にエッチングし、内層導体1のみをスルーホール6の内壁面より選択的に露出させ、この内層導体1の露出面1Aの表面積を増大させ、後の工程でスルーホール6内に形成される無電解銅メッキ層との接続を強化するエッチバック方法を取っている。

【0011】然し、このエッチバック方法は、この方法に用いる過マンガン酸カリウムの薬液の濃度の制御等を必要とし、薬液の管理や、薬液の調合が煩雑で、またエッチング後のエッチング残渣物が多層基板の表面に付着して多層基板の表面を汚染する等の問題が発生し、好ましく無い。

【0012】本発明は上記した問題点を解決し、前記した煩雑な薬液を用いなくて、然も内層導体と表裏両面層の銅箔との接続が良好に成るようにしたプリント配線板の製造方法の提供を目的とする。

## 【0013】

【課題を解決するための手段】本発明のプリント配線板の製造方法は、内層導体を形成した中間層基材、銅箔、およびプリプレグを前記中間層基材の一端部が前記プリプレグの一端部よりはみ出すようにして多層構造に積層し、スルーホールを開口した後、前記中間層基材の内層導体と表面層の銅箔が互いに導通するようにして多層構造に積層した基板を電解銅メッキ液内に浸漬し、前記ス

ルーホールの内壁面に導出されている内層導体と、表面層の銅箔に選択的に電解銅メッキ層を形成し、次いで該基板を無電解銅メッキ液に浸漬してスルーホール内壁面全体と、表裏両面層の銅箔に無電解銅メッキ層を形成した後、該基板を電解銅メッキ液に浸漬した後、電解銅メッキ方法によりスルーホール内と表面層の銅箔に電解銅メッキ層を形成する工程を有することを特徴とするものである。

## 【0014】

【作用】本発明の方法は、内層導体を形成した中間層基材、銅箔、およびプリブレグを前記中間層基材の一端部が前記プリブレグの一端部よりはみ出すようにして多層構造に積層し、スルーホールを開口した後、前記中間層基材の内層導体と表面層の銅箔が互いに導通するようにして多層構造に積層した基板を電解銅メッキ液内に浸漬し、前記スルーホールの内壁面に導出されている内層導体と、表面層の銅箔に選択的に電解銅メッキ層を形成する。

【0015】このようにすると、前記したスルーホール内に導出された内層導体の露出面の表面積が増大し、その後、スルーホール内に形成する無電解銅メッキ層との接続が良好となる。また樹脂のみを選択的にエッチバックする煩雑な薬品を用いる必要がなく、通常のプリント配線板の製造に用いる電解銅メッキ液を用いれば良くなる。

## 【0016】

【実施例】以下、図面を用いて本発明の実施例につき詳細に説明する。前記した図3(a)に示したように、表裏両面層の銅箔4A,4B、およびプリブレグ3および内層導体1を形成した中間層基材2を加熱、加圧積層して多層基板を形成する。

【0017】次いで図1(a)に示すように、上記したこの積層時に於いて、中間層基材2の長手方向の寸法がプリブレグより長くなるようにする。そして該中間層基材2の一端部がプリブレグ等を積層して形成した多層基板5の一端部よりはみ出すようにして積層する。

【0018】次いでこの多層基板5にスルーホール6を開口する。次いで図1(b)および図2に示すように、内層導体1と表裏両面の銅箔4A,4Bとの間で導通を取るようになり、該多層基板5のスルーホール6が銅の電極板13と対向するようにして電解銅メッキ液12中に浸漬する。そして電解銅メッキ法を用いてスルーホール6内に露出した内層導体1の露出面1A、および表裏両面の銅箔4A,4B上に選択的に電解銅メッキ層8を形成する。

【0019】この方法は以前に本出願人が特願平3-52334号に於いて提案した高アスペクト基板のメッキ方法と同様に、プリント配線板の端部より、はみ出した中間層基材の内層導体より電解銅メッキ処理に必要となる電流を供給して行う。

## 【0020】このようにすれば、スルーホール6内に露

出した内層導体1の露出面上に選択的に電解銅メッキ層8が形成される。次いで図1(c)に示すように、この多層基板5を無電解銅メッキ液(図示せず)内に浸漬し、スルーホール6内および表裏両面の銅箔4A,4Bに無電解銅メッキ層7を形成する。

【0021】このようにすると、前記した電解銅メッキ法により形成したスルーホール6の内壁面に導出された内層導体1の露出面上に選択的に電解銅メッキ層8が形成されているので、この内層導体1のスルーホール6内の導出された露出面の表面積が大きくなり、後の工程で形成した無電解銅メッキ層7との接続が充分取れるようになり、従来のように内層導体の露出面と無電解銅メッキ層との接続不良が減少し、動作時にその部分で発熱する現象が除去できる。

【0022】また、この電解銅メッキ液は通常のプリント配線板の製造工程に用いられているのを、そのまま利用でき、煩雑なエッチバック用の薬液を特別に準備して用いる必要がなくなる。

【0023】次いで、図1(d)に示すようにこの多層基板のスルーホール内、および表裏両面の銅箔上に電解銅メッキ層8を形成する。次いでスルーホール内の内層導体の露出面の電解銅メッキの際に用いられ、多層基板5の一端部より、はみ出ている中間層基材2を切断して所定の寸法のプリント配線板とする。

【0024】このようにすると、スルーホール内壁面に導出された内層導体と、表裏両面の導体層との接続が充分良好に取れるようになり、接続不良の発生し難い高品質のプリント配線板が得られる。

【0025】  
【発明の効果】以上述べたように、本発明の方法によれば、エッチバック方法に用いるような煩雑な薬液を用い無くとも、スルーホールの内壁面とプリント配線板の表裏両面の導体層との接続が良好な高信頼度のプリント配線板が得られる効果がある。

## 【図面の簡単な説明】

【図1】 本発明の方法の工程を示す断面図である。

【図2】 本発明の方法に於ける電解銅メッキ方法の説明図である。

【図3】 従来の方法を示す説明図である。

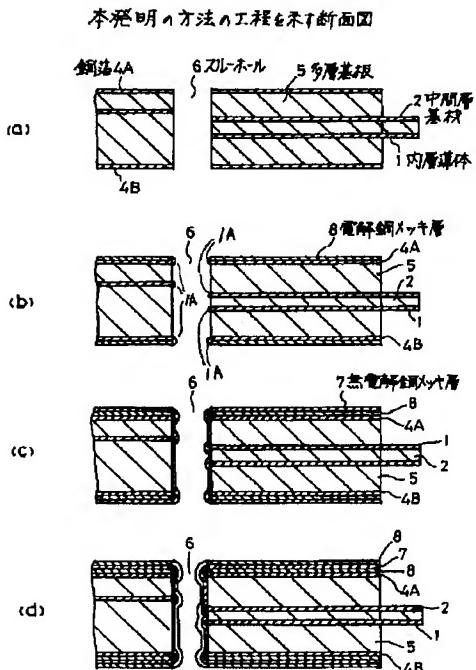
【図4】 従来の方法を示す断面図である。

## 【符号の説明】

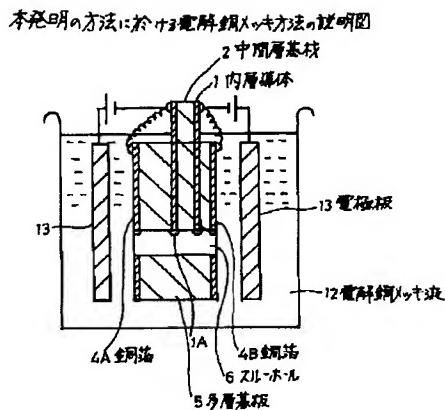
- 1 内層導体
- 2 中間層基材
- 3 プリブレグ
- 4A,4B 銅箔
- 5 多層基板
- 6 スルーホール
- 7 無電解銅メッキ層
- 8 電解銅メッキ層
- 12 電解銅メッキ液

## 13 電極板

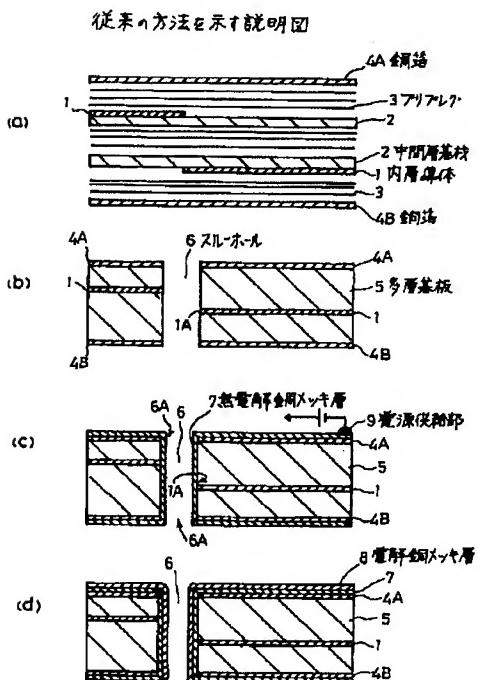
【図1】



【図2】



【図3】



従来の方法を示す断面図

